COMPARING THE EFFECTS OF VIDEO MODEL AND IN VIVO PROMPT PROCEDURES ON TEACHING VOCAL MANDS TO CHILDREN WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

Deficits in language and communication skills are defining attributes of an Autism Spectrum Disorder (ASD) diagnosis. Therefore, explicit instruction is often required to help children with ASD develop vocal mand repertoires. The present study extended Plavnick and Vitale's (2016) study comparing the effects of two mand training procedures. Using an adapted alternating treatment design, the present study compares the effects of in vivo modeling and video modeling on the acquisition and mastery of vocal mands in two preschool aged children with ASD attending an early intensive behavioral intervention (EIBI) center. The results showed that both in vivo mand training and video-based mand training were effective in teaching children with ASD a variety of vocal mands. These findings indicate that when effective, an in vivo model is likely the most efficient and convenient method for teaching vocal mands. However, a video model may be appropriate in mand training when individuals have a history of vocal prompt dependency or when a child is struggling to acquire mands using in vivo mand training procedure.

Keywords: Autism spectrum disorder, mand training, video modeling, verbal behavior

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INTRODUCTION

A mand, colloquially referred to as a request, is a verbal operant that is reinforced by the delivery of a specified reinforcer (Skinner, 1957). The form of the mand response is characteristically similar to the reinforcement received as the consequence of the verbal behavior (Skinner, 1957). For example, when I say “I want a cheeseburger” in the drive through line, I receive the cheeseburger at the window from the worker. Another example of a mand is when a baby uses American Sign Language to sign “more,” and his mother gives him more tickles.

The mand is under the functional control of motivating operations that describe states of deprivation, satiation, and aversive stimulation (Laraway et al., 2003; Skinner 1957). Specifically, an establishing operation (EO), is a type of motivating operation that temporarily increases the likelihood of a stimulus as a particular reinforcer, and therefore increases the future likelihood of engaging in the behavior that precedes the delivery of that reinforcer (Laraway et al., 2003). EOs are vital to understanding manding because an EO must be present for an individual to emit a mand. Therefore, a mand is a request for a specific consequence that is affected by one’s current motivations. Teaching an individual to mand is important because mands allow the individual to communicate their wants and needs and control access to reinforcement from the verbal community (Sundberg & Michael, 2001).

Mands are typically the first verbal operant to develop in young children (Sundberg & Michael, 2001). However, deficits in language and communication skills are defining attributes of an autism spectrum disorder (ASD) diagnosis and may inhibit or delay the acquisition of manding (American Psychiatric Association [APA], 2022). Although there are various topographies of mands such as vocal, gestural, picture exchange, and other behaviors (i.e. eye gaze, crying), vocal mands are most likely to be understood by the broader verbal community

(Plavnick & Vitale, 2016). Because of this, vocal mands can be considered an efficient topography to ensure the individual contacts as much socially mediated reinforcement as possible (Plavnick & Vitale, 2016). Delays in the development of vocal mand repertories can prevent children with ASD from effectively communicating their wants and needs with others, limiting their access to socially mediated reinforcement (Shafer, 1994; Albert et al., 2012). Therefore, explicit vocal mand instruction is an essential focus of early intensive behavioral intervention (EIBI) for children with ASD (Sundberg & Michael, 2001).

Mand training procedures that effectively develop vocal mand repertories in individuals with ASD have been of particular interest to researchers and practitioners. When explicitly teaching a child to mand, it is necessary that an EO is present to ensure that the mand is functionally controlled by and under the stimulus control of the EO (Sundberg & Michael, 2001). Mand training requires procedures that alter and contrive EOs to evoke vocal mand responses (Hall & Sundberg 1987; Sundberg & Michael, 2001; Jennett et al., 2008; Jessel & Ingvarsson, 2022). For instance, when teaching a learner to mand for their most preferred snack, there must be an EO present for the snack. Practitioners can create an EO for the snack by restricting access to the snack for a period of time prior to mand training. Restricting access to the snack creates an EO for the snack because the child is likely in a state of deprivation. In this state of deprivation, the likelihood of that snack functioning as a reinforcer is increased and the child is more likely to emit the mand to receive the snack. This strategy was employed by O'Reilly et al. (2012), and the researchers found that three children with ASD were more likely to emit vocal mands when presession access to target items was restricted. Furthermore, EOs can be contrived by allowing the learner momentary access to a preferred item then immediately blocking their access to the item (Jennett et al., 2008; Centone et al., 2019). This momentary access creates an EO for the item. Recently, Centone et al. (2019) found that students with ASD could be taught to vocally mand for preferred items from peers when they were first provided with a preferred item then access to the item was blocked and given to the peer. Contriving and altering EOs is an essential component to promoting the development of vocal mand repertoires in young children with ASD.

In addition to contriving EOs, when teaching children with ASD who have language and communication deficits, a vocal model or prompt may be necessary during initial training (Green, 2001). For example, Jennett et al. (2008) used an in vivo prompt procedure to teach young children with ASD to mand for one part of a two-part toy. A progressive time delay of the vocal model was used to effectively transfer stimulus control from the prompt to the EO for five of the six participants (Jennett et al., 2008). However, the sixth participant did not emit independent vocal mand responses without the vocal model. This participant's responding is consistent with research indicating that vocal prompts can be difficult to fade when teaching some children with ASD (Bourret et al., 2004; Gorgan & Kodak, 2019).

Innovations in prompting procedures have been investigated with the advent of technology. Video modeling has been of particular interest to researchers and involves showing a video-recorded display of desired behaviors to teach an individual to imitate and emit the target response (Bellini & Akullian, 2007). Multiple studies have found that video modeling can effectively teach a variety of skills to young children with ASD such as pretend play skills (Carmody & Stauch, 2020), social expressive skills like facial expressions (Charlop et al., 2010), and toilet-training skills (Mclay et al., 2015; Lee et al., 2014). Moreover, video modeling has been shown to be an effective intervention for teaching language and communication skills to children with ASD. Recently, Ezzeddine et al. (2020) found that video modeling alone was effective in increasing scripted comments in three of their six participants during peer leisure activities. The other three participants required a treatment package including video modeling, tangible reinforcement, and additional prompting to increase their peer directed play comments (Ezzeddine et al., 2020). Findings such as these highlight the potential utility of video modeling as a sole intervention or a component of a treatment package for teaching socially significant language and communication skills to children with ASD.

Video modeling is a promising intervention for teaching vocal mands because the child can observe an evocative event, a model appropriately engaging in the target mand response, and a listener delivering the related consequence and reinforcement (Plavnick & Ferreri, 2011; Plavnick & Vitale, 2016). During traditional mand training, the listener temporarily takes on the role of the speaker when providing the vocal model of a target mand, which may complicate the transfer of stimulus control (Plavnick & Vitale, 2016). Observing the entire communicative exchange via a video model could clarify the behavioral contingency in a manner that is not possible with conventional mand training, potentially facilitating faster transfer of stimulus control from prompts to the EO (Plavnick & Vitale, 2016).

Several studies have demonstrated the benefits of using video modeling during mand training. Plavnick and Ferreri (2011) used a function-based video modeling intervention to teach vocal and picture exchange mands to children with ASD and severe language impairments. The authors first conducted a functional analysis of gestural communicative behavior for each of their participants and found that gestural communicative behavior functioned for access to materials for three participants and attention for one participant. Based on these results, each participant was taught generalized mands that replaced the corresponding function of their gestural communicative behavior using video modeling. The function-based video modeling mand training intervention was compared to a non-function-based video modeling intervention. All four participants displayed higher mean rates of responding of target mands in the function-based condition than in the non-function-based condition. Additionally, while one participant acquired a similar number of mands in both the function-based and non-function-based video modeling conditions, he rapidly acquired target mands in the function-based condition compared to the non-function-based condition under which mands were acquired more slowly. The Plavnick and Ferreri (2011) study showed the importance of communicative function in contriving EOs during mand training as well as demonstrating that video modeling is an effective method for teaching both vocal and picture exchange mands.

Plavnick and Vitale (2016) extended Plavnick and Ferreri (2011) by directly comparing video modeling and in vivo mand training procedures on the acquisition and mastery of vocal mands in children with ASD. The authors found that three of the four participants acquired more mands in the video modeling condition and all four participants mastered more mands in the video modeling condition compared to the in vivo modeling condition (Plavnick & Vitale, 2016). One participant acquired the same number of mands in both conditions, but she mastered more mands in the video modeling condition. Because more target mands were mastered in the video modeling condition compared to the in vivo modeling condition, her pattern of responding indicates that video modeling more effectively transferred stimulus control from the prompt to the EO (Plavnick & Vitale, 2016). In other words, her data demonstrate that she became dependent on the in vivo model, and thus, the teaching procedure produced fewer sustained independent vocal mand responses. These results highlight that video modeling may effectively combat prompt dependency.

Another interesting finding of the Plavnick and Vitale (2016) study was that the trends in data for the video modeling condition appeared to be accelerating at a faster rate than the in vivo prompt condition, indicating that video modeling facilitated faster acquisition and transfer of stimulus control than the in vivo intervention. Similarly, one participant mastered and acquired mands quicker in the video modeling condition during the beginning of the study then appeared to master and acquire mands at a similar rate in both conditions towards the conclusion of the study (Plavnick & Vitale, 2016). His results suggest that video modeling may be especially useful in EIBI settings as a tool when first teaching vocal mands to children ASD. The conclusions that video modeling can facilitate efficient transfer of stimulus control, prevent prompt dependency, and lead to quicker acquisition and mastery of vocal mands suggest that video modeling could benefit young children with ASD when first learning to vocally mand.

Although, Plavnick and Vitale (2016) demonstrated a functional relation between video modeling and increased vocal mand responses, the authors identified multiple limitations to their study. The authors noted that there were several differences between the teaching procedures, particularly the delivery of reinforcement. In the in vivo condition, differential rates of reinforcement were provided for prompted responses (i.e., 15-s of access) and unprompted responses (i.e., 30-s of access) compared to the video modeling condition in which reinforcement was provided for 30-s following all correct responses whether prompted or independent (Plavnick & Vitale, 2016). The different reinforcement procedures across conditions could have affected the authors' results. Further, the study did not include an extended control condition to eliminate history and maturation threats to internal validity (Plavnick & Vitale, 2016). Additionally, the authors determined that limiting the number of trials to seven per session may have slowed down acquisition and led to one mand being emitted less than the other two targets (Plavnick & Vitale, 2016). These limitations warrant future extensions of this line of research.

Because video modeling offers promising solutions to the challenges associated with traditional mand training procedures, the purpose of the present study was to rectify some of the procedural limitations of Plavnick & Vitale (2016). Specifically, the present study remedies the reinforcement procedures, includes extended control condition, and increases the number of trials presented. The current study used an adapted alternating treatment design to compare the effects of mand training using an in vivo model and mand training using a video model on the acquisition and mastery of vocal mands in two preschool aged children with ASD. Specifically, this study sought to answer the following questions:

1) To what extent do students with ASD acquire targeted vocal mands under two different teaching procedures: in vivo mand training and video-based mand training?
2) To what extent do students with ASD master targeted vocal mands under two different teaching procedures: in vivo mand training and video based mand training?

METHOD

Participants

Two participants with a medical diagnosis of ASD were included in the study. Both participants received behavior analytic services in an EIBI clinic, which was affiliated with a Midwestern university, for 32 ½ hours a week. Participants for the study were identified with the help of their rendering Board Certified Behavior Analyst (BCBA). Inclusion criteria included: an ability to emit vocalizations, an echoic repertoire, a single word mand repertoire using Picture Exchange Communication System (PECS; Bondy & Frost, 1994) or some single word vocal mands, ability to relinquish toys in 90% of opportunities, and engagement with a variety of reinforcers. Exclusion criteria included: learners who were able to consistently vocally mand for more than five items.

Lilly was a 3-year-old girl and had been receiving services from the EIBI clinic for 3 months. Lilly was white, and the primary language spoken in her home was English. Lilly typically used single word utterances or single icon PECS to communicate her wants and needs. Lilly's most recent *Verbal Behavior Milestones Assessment and Program Placement* (VB-MAPP; Sundberg, 2008) score was 32 with strengths in visual perceptual and match to sample skills and exploratory play skills. Her treatment goals focused on using PECS to mand, conditioning a token board, completing interlocking piece puzzles, and following one-step directions.

Oliver was a 3-year-old boy and had been receiving services from the EIBI clinic for 1 year. Oliver was black, and the primary language spoken in his home was English. Oliver typically used multiple PECS icons on a sentence strip or single word vocal mands to communicate his wants and needs. Oliver's most recent VB-MAPP score was 98 with strengths in participating in group instruction and listener responding. His treatment goals focused on answering simple interverbal WH- questions, responding to his name, and completing a photographic activity schedule with social interactions.

The implementer was the first author who was a master's student in Applied Behavior Analysis and had a foundational understanding of reinforcement and the role of motivating operations. The implementer worked closely with the participants as a behavior technician and assistant behavior analyst providing behavior analytic treatment to both Lilly and Oliver.

Upon intake to the EIBI clinic, families signed a consent form for the child to participate in research and for data collected to be used in research. Consent could be withdrawn at any time for any reason with no penalty to the participant. Assent was determined by the client's willingness to walk over to the table where sessions were conducted and sit with the implementer for the duration of the session. If participants eloped from the table multiple times or engaged in severe aggressive or self-injurious behaviors, it was determined that participants were not assenting to participation in the study, and the session would immediately be terminated. Assent was never withdrawn throughout the course of the study by either participant.

Setting

All sessions were conducted in the EIBI clinic treatment room where the participants received behavior analytic services. The participants received 1:1 therapy in the treatment room with up to eight other peers and eight adults present. The treatment room was modeled after a conventional preschool classroom and located within a local public preschool. The treatment room contained small blue tables for individual treatment sessions; a larger semi-circle table used for group instruction, snack, and lunch; and a play area with various toys, books, and play activities. Sessions were conducted at a small blue treatment table located in the back of the treatment room and near a large wall of shelves. This configuration was utilized with the intention of mitigating access to competing reinforcers that were not currently targeted and to help contrive EOs by placing target items on the shelves, all while remaining within the participants' natural learning environment. Sessions typically lasted 3-10 minutes depending on if EOs were present and whether targets were being probed for acquisition or mastery.

Materials

Materials for the study included a video camera to record session data, data collection sheet, pen, a shelf near the instructional table, highly preferred toys and edibles, PECS binder during baseline or control probe sessions, and an iPad® with pre-made video models during the video-based mand training condition.

Video models were created using the methods explained in Plavnick and Ferreri (2011) and Plavnick and Vitale (2016). An iPad® was used to record 5- to 15-s video clips of an adult model engaging in the target vocal mand response for each of the targets assigned to the video-based mand training condition. The video clips included the adult model, an adult listener (the implementer), and the stimuli relevant to each target mand. The clips began with the adult model appropriately engaging with the stimulus associated with the target mand. The listener then gently removed the stimulus and contrived an EO for the item by placing it on a shelf. The model emitted the targeted vocal mand response. The listener delivered the corresponding reinforcer to the model, and the clip ended with the model playing with the toy or eating the edible.

Dependent Variables and Measurement Procedures

Definition of Dependent Variables

The dependent variables of this study were acquired and mastered vocal mands (see Table 1 for specific mands taught to each participant across conditions). Acquired mands were defined as the target mand response emitted independently for two out of three consecutive trials within or across sessions (Plavnick & Vitale, 2016). A mastered mand was defined as a correct independent mand response emitted on the first trial of the day for three out of five consecutive days (Plavnick & Vitale, 2016). The criteria for mastered mands indicated that the mand response had maintained over a longer duration. Participant responses were recorded on a trial-by trial-basis of targeted mands. A response was considered an independent vocal mand if the participant emitted the correct response topography or an approximation with at least 50% of the sounds occurring in the correct order without a vocal or video model (Plavnick & Vitale, 2016). For example, if the target mand was "bubble" and the participant emitted "bub" without a prompt, this response was coded as an independent vocal mand. Data were summarized as a cumulative record of total acquired and mastered mands under each condition for each participant.

Selection of Target Mands

Mand targets for baseline and control, in vivo, and video model conditions were selected using a series of three brief multiple stimuli without replacement preference assessments (MSWO). This strategy was utilized to increase the likelihood that mand targets were similarly preferred across the two intervention conditions. The mand targets for the baseline and control probes were determined using the least preferred items from the initial brief MSWOs, yielding three targets. For the intervention conditions, the first and second highest preferred stimuli from each brief MSWO were paired then allocated to a condition to create relatively similar sets. For example, if the results of a brief MSWO indicated that ice cream was the highest preferred stimulus and car was the second highest preferred, then these two stimuli were paired and one of the mand targets would be assigned to the in vivo condition and the other target would be assigned to the video modeling condition. While the implementer attempted to counterbalance the targets in each condition, the sound and similarity of the words for the targets were also considered in creating similar sets. For example, "shark" and "shrek" were intentionally assigned to different conditions due to how similar they sound. This process was replicated to yield three mand targets for the in vivo condition and three mand targets for the video-based condition for every series of three brief MSWOs conducted. Additional series of brief MSWO preference assessments were conducted throughout the course of the study to create subsequent mand targets for each intervention condition. Targets were generated throughout the study to capture EOs and account for participants' current interests.

Difficulty of targets were controlled by requiring that participants only needed to emit at least 50% of the target mand for the response to be considered a correct mand response. However, if three sessions passed with no indication of an EO or progress towards mastery of a target, that target was removed from the study to increase the likelihood that an EO was at strength during mand training. Three targets were removed during the video modeling condition for Lilly.

Vocal Mand Targets

Participant	Baseline/ Control	Video Model Mand Training	In Vivo Mand Training
Lilly	Giggle Stick	Light Up Toy (removed)	Baby Shark
	Minnie Mouse	Spinner	Gummies
	Cereal	Oreo	Wind Up Toy
		Dinosaur	Sticky Hand
		Cheetos	Pringle
		Slinky (removed)	Slime
		Duck	Doll
		Jack-in-Box (removed)	Pirates Booty
		Shark	Squishy
		Marshmallow	Smarties
		Cymbals	Shrek
Oliver	Goldfish	Fan	Slinky
	Phone	Spinner	Fruit Snack
	Wind Up Toy	Oreo	Light Up Toy
		Ball	Frosted Animal Crackers
		Skittle	Worm
		Tambourine	School Bus
		Shark	Ring Pop
		Pringle	Airplane
		Dinosaur	Pop it

Table 1. Vocal Mands Taught to Each Participant Across Conditions

Interobserver Agreement

Interobserver agreement (IOA) data were collected by a second observer and recorded trial-by-trial responses for 30-33% of baseline/ control, in vivo mand training, and video modeling mand training sessions for both participants. The second observer was a master's student in Applied Behavior Analysis and was trained on the definitions, measurement coding, examples, and non-examples of the dependent variables prior to collecting IOA data. The second observer training consisted of a short PowerPoint and allowed time for clarifying questions. IOA was calculated by comparing the implementer's data to the second observer's data using a point-by-point reliability calculation (Ledford et al., 2018). Using this calculation, each trial was scored as an agreement or disagreement, and total agreements were divided by the sum of agreements and disagreements and multiplied by 100 to obtain an IOA percentage. Sessions where IOA was measured were randomly selected by writing the session numbers from each condition on pieces of paper and drawing session numbers. Mean IOA for Lilly was 100% during baseline and control probes, 98% (range =89-100) during the in vivo condition, and 97% (range = 86-100) during the video-based condition. Mean IOA for Oliver was 100% during baseline and control probes, 100% during the in vivo condition, and 100% during the video-based condition.

Interobserver Agreement

Participant	Mean IOA for Baseline/ Control	Mean IOA for Video Modeling Condition	Mean IOA for In Vivo Condition
Lilly	100%	97% (range= 86-100)	98% (range 89-100)
Oliver	100%	100%	100%

Table 2. Mean Interobserver Agreement Across Participants and Conditions Calculated using Point-to-Point Reliability Calculation

Experimental Design

An adapted alternating treatment design was used to compare the effect of in vivo and video modeling mand training procedures on the acquisition and mastery of mands for the two participants. Adapted alternating treatment designs are used to compare the efficacy of two or more independent variables on two or more related but different dependent variables (Wolery et al., 2018). In this way, a variety of mand targets could be validly compared across the two conditions. This design was utilized in the current study because emitting vocal mands are non-reversable behaviors and this study compares the effects of two mand training procedures on the acquisition and mastery of a variety mand targets.

Considerations and threats for internal validity were systematically controlled from the onset of the study. Threats to procedural fidelity due to the rapid alternation of teaching conditions were controlled by collecting adequate procedural integrity data for 30-33% of sessions in all conditions. Threats of multitreatment interference were minimized by ensuring adequate time between instructional sessions in the comparison portion of the study with at least an hour in between sessions but typically one session per day. Lack of equal difficulty of behavior sets was minimized by requiring the participant to emit only 50% of the target mand to be recorded as a correct independent mand. This threat was furthered controlled by pairing mand targets based on their rank of preference, considering the production of the target mand, and assigning a target from each pair to either condition so that targets were of relatively similar preference. Threats of history and maturation were controlled by including an extended control condition.

Experimental Procedures

Preference Assessments

A series of three one session brief MSWO preference assessments was used to generate mand targets for all conditions. This method was selected because brief MSWOs yield relatively reliable predictions of potential reinforcers and are extremely time efficient (Conine et al., 2021; Kang et al., 2013; Carr et al., 2000). For each series, there were two MSWOs containing tangible toys and one MSWO containing edibles. The MSWOs followed the procedures laid out in DeLeon and Iwata (1996) but for only one session. Once all five trials were conducted, the brief MSWO was completed and the next brief MSWO with new stimuli was presented. Preference assessments were conducted intermittently throughout the study to generate additional mand targets as needed.

EO Assessment

Anytime a new target was introduced during a session, an informal EO assessment was conducted to increase the likelihood that an EO was at strength before starting a mand training trial (Plavnick & Vitale, 2016). The implementer showed the participant one of the preferred stimuli associated with a mand target and waited approximately 10-s to see if the participant would reach for the item, indicating an EO was likely at strength for the stimulus. The participant was allowed approximately 5-s to engage with the stimulus, then the item was gently removed if it was a toy. If the participant did not reach for the item but engaged in a mand response, the response was coded as a trial. If the participant did not reach for the item, it was removed, and the implementer presented a stimulus associated with different mand target to assess for an EO. The EO assessment was conducted for all three stimuli in a set, if necessary, until the participant indicated interest in one of the stimuli.

Baseline and Control Probes

Baseline data were collected to determine participants' current level of performance prior to intervention. Because mand instruction using PECS was already occurring as part of participants' treatment goals, the baseline condition was conducted in the context of "instruction-as-usual" for each participant (Plavnick & Vitale, 2016). During these sessions, the participant's PECS binder was available at the instructional table. If a mand occurred, either vocally or with the support of PECS, reinforcement was delivered for 30-s. However, only independent vocal mands were scored as a vocal mand towards meeting acquisition or mastery criteria. To increase interval validity, these procedures were replicated throughout the comparison portion of the study as an extended control condition. Control probes used the same targets as baseline and were conducted every six sessions.

Intervention: In Vivo Mand Training

During the in vivo mand training condition, instruction was provided based on the procedures described by Sundberg and Partington (1998) and replicated by Plavnick and Vitale (2016). The EO assessment was conducted. If a mand response occurred during the EO assessment procedures, it was coded as a trial. After the EO assessment, an EO was contrived for the target mand by placing the item on a high shelf. If the participant independently emitted the corresponding vocal mand target, then the implementer provided the preferred stimulus for approximately 30-s or a larger piece of an edible. If the participant did not emit the target mand after 5-s of the evocative event, the implementer provided the vocal model as a prompt to evoke the target mand response. A correct prompted response was reinforced with approximately 15-s of access or a smaller piece of edible. The consequence for an incorrect response was that the implementer removed the preferred stimulus from the participant's field of vision and administered a series (2-5) mastered one step instructions before initiating the next trial. After three consecutive trials targeting the initial target, the implementer removed the stimuli associated with that mand and assessed participant interest in one of the other targets. This strategy was utilized to prevent satiation and ensure equal trials of each target. These procedures were repeated so that there were three trials of each mand target per session.

Once a target mand met acquisition criteria it was probed for mastery, which occurred during the first trial of the session. The EO assessment procedures were conducted. If the participant emitted a vocal mand response during the EO assessment, this was coded as a trial. If the participant did not emit the vocal mand during the EO assessment, then the item was placed on a high shelf to contrive an EO. If the participant emitted a correct independent vocal mand, then this was reinforced with 30-s of access to the reinforcer or a larger piece of the edible reinforcer and coded as a correct response toward meeting mastery criteria. If the participant erred, then the implementer provided a series of one-step instructions and the target was retaught with three instructional trials later during the session.

Sessions were terminated once three trials of each acquisition target and one trial of each mastery target were conducted, after running the reassessment procedure three times without the participant indicating interest in the stimuli, or a second instance of self-injurious behavior, aggression, or elopement.

Intervention: Video-Based Mand Training

The video modeling mand training condition replicated the video-based condition in Plavnick & Vitale (2016). The EO assessment was conducted. If the participant manded during the EO assessment, it was coded as a trial. After the EO assessment, the implementer contrived an EO to evoke the target mand by placing the item on a high shelf. If the participant did not respond within 5-s of the evocative event, then the implementer held up the iPad, instructed "watch this," and played the video model. No further prompts were provided. Diverging form Plavnick and Vitale's (2016) methodology, a correct response following the video model was followed by delivery of the corresponding item for approximately 15-s or a smaller piece of edible. A correct independent response was differentially reinforced with 30-s of access or a larger portion of an edible. An incorrect response was followed by the removal of the preferred stimulus from the field of vision of the participant and the delivery of a series of simple one-step instructions before initiating a new mand training trial. After three consecutive trials for a single target, the EO assessment was conducted for the remaining targets to probe interest and increase the likelihood of capturing an EO.

Similar, to the in vivo condition, once a target mand met acquisition criteria it was moved to probe for mastery, which occurred during the first trial of the session. The EO assessment procedures were conducted to assess for an EO. If the participant emitted a vocal mand response during the EO assessment, this was coded as a trial. If the participant did not emit the vocal mand during the EO assessment, then the item was placed on a high shelf to contrive an EO. If the participant emitted a correct independent vocal mand, then this was reinforced with 30-s of access to the reinforcer or a larger piece of the edible reinforcer, and it coded as a correct response toward meeting mastery criteria. If the participant erred, then the implementer provided a series of one-step instructions, and the target was retaught with three instructional trials later during the session.

Sessions were terminated once three trials of each acquisition target and one session of each mastery target were conducted, after running the EO assessment three times without the participant indicating interest in the stimuli, or a second instance of self-injurious behavior, aggression, or elopement.

Prompt Fading

Prompts were used across both intervention procedures to teach vocal mand responses. The in vivo model and video model were gradually faded using a time delay procedure to promote independent manding. Prompt fading began once the participant emitted the prompted mand for three consecutive trials or beat the prompt, which was provided after 5-s of contriving the evocative event. If the participant was independent on a mand target but erred more than two trials in a row, the model was reimplemented.

Maintenance Probe

A probe session was conducted 22 days after intervention had concluded to assess maintenance of all acquired and mastered mands. One trial was administered for every vocal mand target. The targets from the video modeling, in vivo, and control conditions were randomly ordered. The maintenance probe session began with the EO assessment procedures for a stimulus associated with a vocal mand target. If the participant emitted an independent vocal mand during the EO assessment procedure this was coded as a correct trial. After assessing for an EO, the implementer placed the stimulus on a high shelf. If the participant emitted a vocal mand, this was coded as an independent vocal mand for the target and reinforced with 30-s of access or a larger piece of edible. If the participant did not emit a vocal mand or emitted an incorrect vocal mand, the trial was coded as incorrect response, and a series of one-step instructions were implemented.

Procedural Fidelity

Procedural fidelity data were collected for 30-33% of sessions across conditions and participants. The implementer created a procedural checklist (see Appendix A) for the three conditions. Steps on the checklist were scored as occurring or non-occurring. Number of steps completed were divided by the total number of steps on the protocol checklist and multiplied by 100 to determine the percentage of procedural fidelity per session. The master's student who completed IOA for the study also collected the procedural fidelity data. Sessions coded for procedural fidelity were the same as those coded for IOA. Mean procedural fidelity for Lilly during baseline and control probes was 100%, in vivo mand training 100%, and video-based mand training 100%. Mean procedural fidelity for Oliver during baseline and control probes was 100%, in vivo mand training 100%, and video-based mand training 100%.

Procedural Fidelity

Participant	Mean Procedural Fidelity for Baseline/ Control	Mean Procedural Fidelity for Video Modeling Condition	Mean Procedural Fidelity for In Vivo Condition
Lilly	100%	100%	100%
Oliver	100%	100%	100%

Table 3. Mean Procedural Fidelity Across Participants and Conditions

RESULTS

Lilly

Figure 1 depicts the cumulative record of vocal mands that Lilly acquired. During initial baseline sessions, Lilly did not acquire any vocal mands. During session 19, the second control probe session, Lilly acquired 3 vocal mands. For the intervention conditions, Lilly acquired an equal number of vocal mands. She acquired 8 vocal mands in the in vivo mand training condition and 8 mands in the video-based mand training. There was an immediate increase in acquired vocal mands once mand training procedures were implemented. Lilly acquired vocal mands in more of a stepwise pattern of gradual then steep acceleration where multiple targets were acquired in a session, especially throughout the in vivo condition and towards the end of video modeling condition.

Figure 2 displays the cumulative record of vocal mands that Lilly mastered. During initial baseline sessions, Lilly did not master any vocal mands. In session 40, the fifth control probe, she mastered 1 vocal mand. For the intervention conditions, Lilly mastered more vocal mands in the in vivo mand training condition compared to the video-based mand training. Throughout in vivo mand training, Lilly mastered 8 vocal mands. During the video-based mand training, Lilly mastered 5 vocal mands. While an increase in mastered vocal mands was demonstrated a four session into the in vivo condition and six sessions into the video model condition, some lag was expected due to the criteria that a mastered mand needed to be emitted for 3/5 consecutive days. For both conditions Lilly began by gradually mastering 1 or 2 vocal mands per session with an accelerating trend, until session 22 of the in vivo condition and session 31 of the video modeling condition where mastery plateaued. After 32 of the in vivo condition rapid mastery and a steep accelerating trend occurred.

The results from the maintenance probe are depicted in Table 2. During the maintenance probe, Lilly emitted 1 of 3 vocal mands from the control set, 6 of 8 vocal mands from the video modeling condition, and 7 of 8 vocal mands from the in vivo condition.

Lilly Acquired Mands

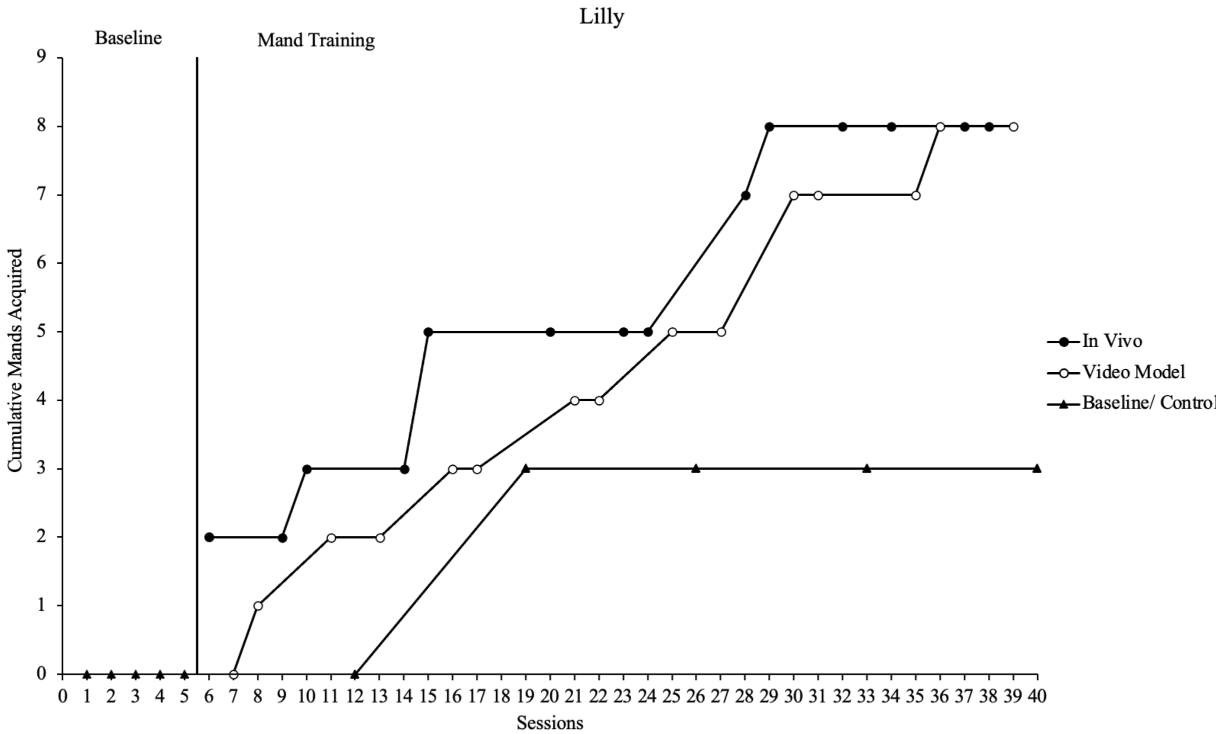

Figure 1. Cumulative Record of Lilly's Acquired Vocal Mands in Each Condition

Lilly Mastered Mands

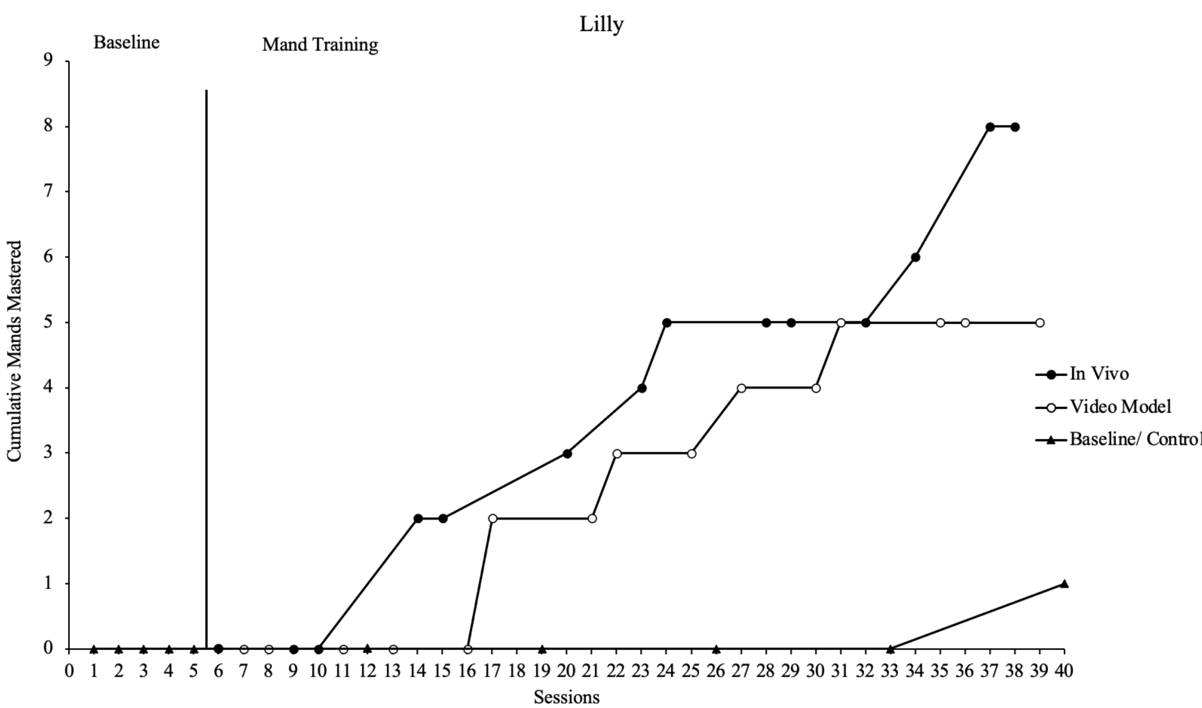

Figure 2. Cumulative Record of Lilly's Mastered Vocal Mands in Each Condition

Oliver

Figure 3 depicts the cumulative record of mands that Oliver acquired. During the initial baseline sessions, Oliver did not acquire any mands. In the subsequent control probes, Oliver acquired 3 vocal mands during session 12. In both intervention conditions, Oliver acquired an equal number of vocal mands. Throughout in vivo and video-based mand training, Oliver acquired 9 vocal mands in each condition. There was an immediate increase in acquired mands once intensive mand training procedure were implemented During the in vivo condition Oliver's pattern of responding shows that first there was a more stepwise pattern of acquisition then this pattern tapered to a more gradual accelerating trend. A gradual accelerating trend in the acquisition of the vocal mands was seen throughout the video modeling condition

Figure 4 displays the cumulative record of mands that Oliver mastered. Oliver did not master any mands during the initial baseline session, but mastered 1 vocal mand during session 33, the fourth control probe. In both intervention conditions, Oliver mastered 7 vocal mands. An increase in mastered vocal mands was demonstrated four sessions into each mand training condition, likely because of the criteria that a mastered mand needed to be emitted for 3/5 consecutive days. Once Oliver began mastering vocal mands during the in vivo condition he rapidly mastered mands in the initial sessions. His mastery plateaued then continued at a gradual accelerating trend for the rest of the study. Oliver mastered vocal mands at a gradual accelerating trend of about 1 mand every other session in the video modeling condition.

In the maintenance probe, Oliver emitted 2 of 3 vocal mand targets from the control set, 6 of 9 vocal mands from the video model condition, and 8 of 9 vocal mands from the in vivo mand training condition. These results are depicted in Table 2.

Oliver Acquired Mands

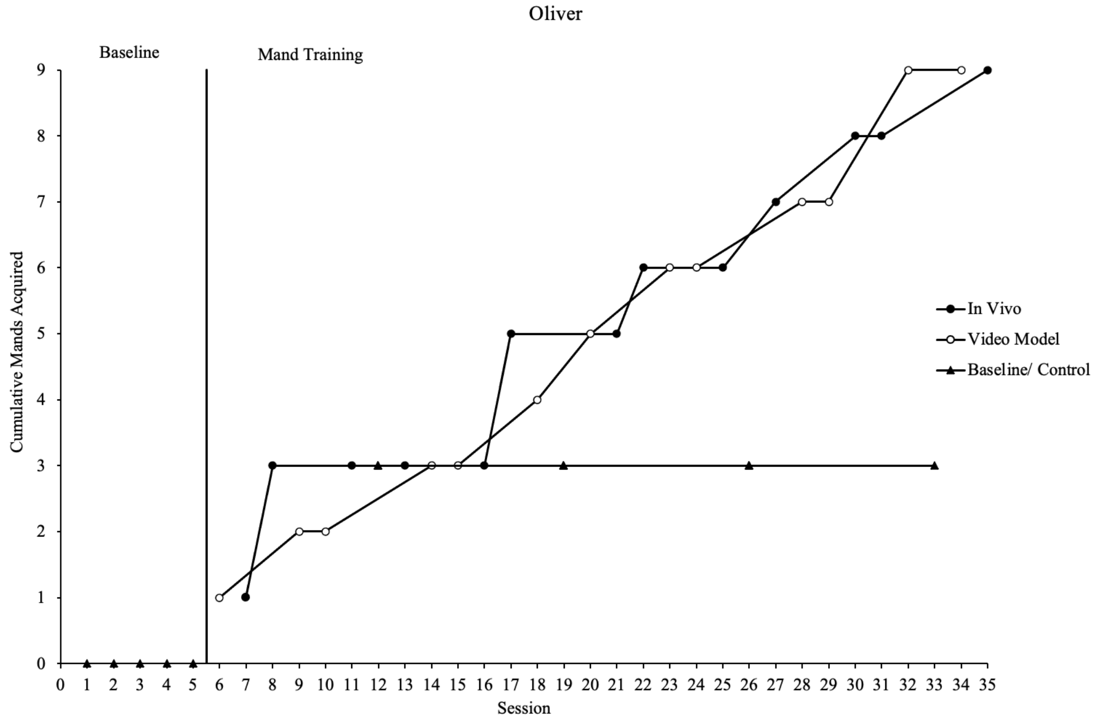

Figure 3. Cumulative Record of Oliver's Acquired Vocal Mands In Each Condition

Oliver Mastered Mands

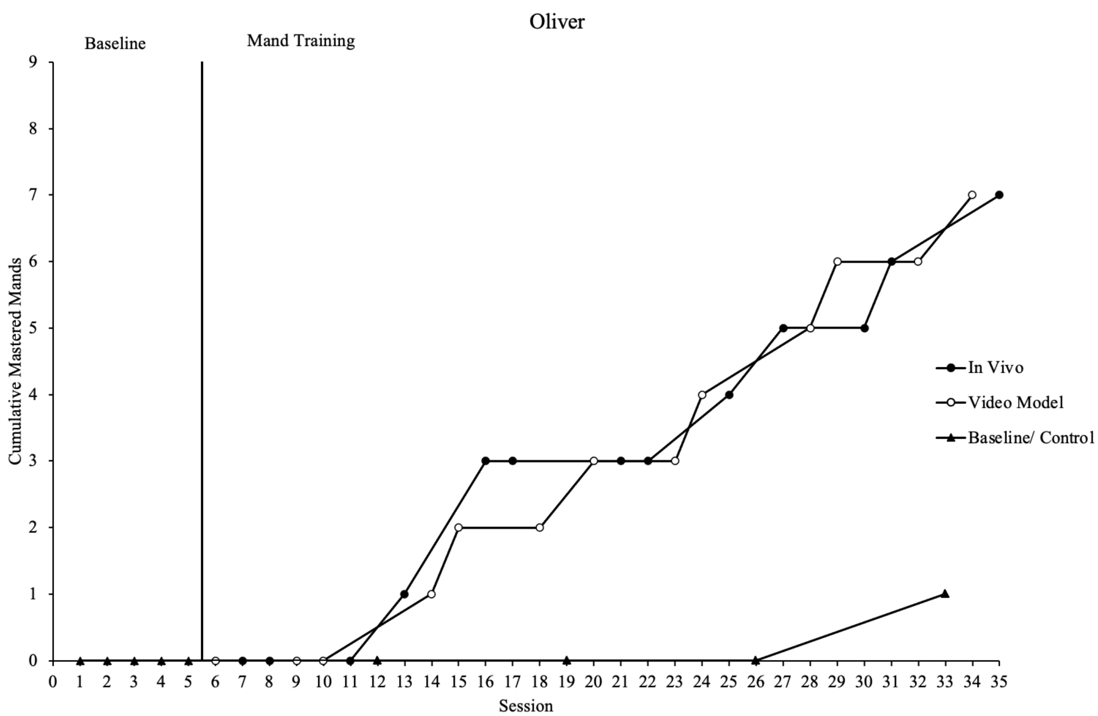

Figure 4. Cumulative Record of Oliver's Mastered Vocal Mands In Each Condition

Maintenance of Acquired and Mastered Mands

Participant	Control	Video Model Mand Training	In Vivo Mand Training
Lilly	*Giggle Stick*	*Oreo*	**Baby Shark**
	Cereal	**Spinner**	*Wind Up Toy*
	Minnie Mouse	**Dinosaur**	**Gummies**
		Cheetos	**Sticky Hand**
		Duck	**Pringle**
		Shark	**Slime**
		Marshmallow	**Doll**
		Cymbals	**Pirates Booty**
Oliver	**Goldfish**	**Oreo**	**Fruit Snack**
	Wind Up Toy	**Fan**	**Light Up Toy**
	Leap Frog Phone	*Spinner*	**Slinky**
		Ball	**Frosted Animal Cracker**
		Skittle	**Worm**
		Tambourine	**School Bus**
		Shark	**Ring Pop**
		Pringle	*Airplane*
		Dinosaur	**Pop it**

Table 4. Maintenance of acquired and mastered vocal mands after 22 days across participants ***bolded*** *targets indicate maintained mands and italicized targets indicate mands that did not maintain*

DISCUSSION

This study sought to compare acquisition and mastery of vocal mands using in vivo and video-based mand training procedures. Both interventions were effective in teaching young children with ASD to vocally mand for a variety of preferred toys and edibles. The interventions facilitated rapid transfer of stimulus control from prompts to the EOs controlling the mand behavior. The present study extends research on mand training procedures and further explicates conditions under which video-based mand training is appropriate.

Each participant acquired and mastered mands at unique rates with distinctive patterns in their acquisition and mastery. At points each participant would acquire or master mands consistently and gradually, and then sometimes they would acquire or master mands rapidly followed by a delay in acquisition or mastery for a few sessions. Both participants acquired an equal number of mands in the two intervention conditions. However, Lilly mastered more mands in the in vivo condition compared to the video modeling condition, and Oliver mastered an equal number of vocal mands in both conditions. These results highlight idiosyncratic patterns of responding to the two intervention conditions.

These idiosyncratic patterns of responding may have been due to the learning history of the two participants. Oliver had been in treatment for a longer period of time and had the skill of imitating both a video model and an in vivo model already in his repertoire. These preexisting skills may explain why he acquired and mastered an equal number of mands in each condition. Lilly had just recently started behavior analytic treatment. Thus, the video-based mand training was the first time a video model was used in her treatment. It may have taken Lilly longer to learn how to imitate the video model, whereas vocal prompts were already prescribed and readily used in her programming. This may have contributed to why she mastered more mands in the in vivo condition.

Another explanation for Lilly's differentiated mastery of vocal mands between intervention conditions could be attributed to the removal of three targets during the video-based mand training. While the three targets (light up toy, slinky, jack-in-box) were removed after three sessions of no progress toward acquisition of the given target, this may have inadvertently slowed down Lilly's overall mastery. It is possible that even though the removed targets were highly preferred items, as determined by the brief MSWOs, they may not have been true reinforcers. If these items were not reinforcers, an EO would not have been present to evoke the mand response. Targeting mands for items that did not function as reinforcers, may have slowed her mastery in the video-based condition.

Although the participants showed near-zero levels of vocal manding during the initial baseline sessions, once explicit mand training strategies were implemented, they acquired 3 baseline targets and mastered 1 each. Typically, participants learning the control targets is a sign of maturation or history and suggest weak internal validity. However, these results may suggest the development of a generalized mand repertoire. A generalized mand repertoire develops when novel mand responses are emitted under novel MOs and novel discriminative stimulus conditions without a previous history of reinforcement (Miguel, 2017). As Lilly and Oliver got better at vocally manding due to the intensive mand training procedures employed throughout the course of the study, it is possible that the skill of vocally manding generalized. Using two different teaching methods and varying instructional approach to teach the same verbal operant, may have inadvertently supported the development of generalized mand repertories (Stokes & Baer, 1977). Additionally, there is a growing body of research showing that with intensive mand training, mands will generalize to novel MOs and settings (Groskrutz et al., 2014; Lechago et al., 2010). Thus, the development of a generalized mand repertoire may account for the acquisition and mastery of control targets during intervention.

The results of the current study differed from Plavnick and Vitale's (2016) findings in which 3 of the 4 participants acquired more vocal mands in the video-based mand training and all participants mastered more mands in the video modeling condition. The differences in results could be due to the dissimilar settings in which the studies were conducted. The Plavnick and Vitale (2016) study took place in a public-school setting, whereas the present study occurred in an EIBI clinical setting. Advantages, challenges, and methods of instruction can vary greatly between settings due to differences in personnel and available resources (Leaf et al., 2017; Sutton et al., 2019). Thus, it is hard to know how previous instructional methods and learning histories in the two distinct environments may have affected the outcomes of the studies.

Moreover, the conflicting results between the two studies could be attributed to the severity of disability and language impairment of the participants. While the severity of Lilly and Oliver's language impairments was not formally assessed prior to intervention, both were able to consistently emit vocalizations and did not display preexisting dependency on vocal prompts. In contrast, the results of the *Preschool Language Scale, Fourth Edition* (PLS-4; Zimmerman et al., 2002) Auditory Comprehension and Expressive Communication subscales for all participants in the Plavnick and Vitale (2016) study indicated extremely low language skills, and two of the participants did not reliably emit spoken words or vocal approximations. These differences in inclusion criteria and severity of language impairment may have affected participants' abilities to access the interventions and ultimately their outcomes in the studies.

Further, the differences in results could be due to procedural modifications made in the current study. In the Plavnick and Vitale (2016) study, the in vivo condition used differential reinforcement of prompted and independent responses compared to video-based mand training condition where all responses were reinforced equally. The present studied remedied this limitation by consistently reinforcing prompted and independent mands across both interventions. This additional control may have allowed this study to more accurately measure the effects of the independent variables on the dependent variables by virtue of having strong experimental control (Barton, Meadan-Kaplansky & Ledford, 2018).

These findings have several implications for practice. First, when effective, an in vivo model is likely the most efficient and convenient method for teaching vocal mands to children with ASD. In vivo models may be more efficient in teaching vocal mands to children with ASD because they allow practitioners to capture more incidental teaching opportunities of naturally occurring EOs and novel mands. Making sufficient video models requires numerous resources and can be laborious. It is unlikely that video models can capture all the unique EOs and relevant environmental stimuli that are required for incidental mand training opportunities. However, a video model may be beneficial and appropriate in mand training when individuals have a history of vocal prompt dependency or when a child is struggling to acquire mands using in vivo mand training procedures.

Practitioners may want to consider ensuring mand training is a continued and central focus of treatment for children with ASD. Beyond being an important strategy for developing verbal behavior and skills to communicate wants and needs, mand training may also be used for rapport building. In the present study, the implementer, other behavior technicians, and the participants' BCBA anecdotally noted how the participants "lit up" or were "so excited" to see the implementer at the beginning of the mand training sessions. Presession pairing strategies involving practitioner led initiations of offering clients preferred items, procedures like those in mand training, have been linked to clients demonstrating fewer interfering behaviors during instructional sessions (Ensor et al., 2023; Shillingsburg et al., 2019). Because mand training can involve the delivery of preferred items, the implementer likely paired herself with the delivery of reinforcement. Thereby, becoming a conditioned reinforcer and strengthening the rapport with the child. The observations from the current study suggest that explicit mand training can be used as a strategy for continued rapport building and presession pairing while simultaneously increasing verbal behavior in children with ASD.

Despite the promising results from the current study, limitations warrant consideration and provide avenues for future research. A limitation of the current study was that the vocal mands were likely multiply controlled and not pure mands. When contriving EOs the preferred items associated with the mand targets were either held by the practitioner or placed on a high shelf which remained in the participant's line of vision. Because the items were still in view, the vocal mand responses may have been under the multiple stimulus control of the visual sight of the item and the EO (Skinner, 1957). This limitation could be remedied by placing the preferred items under a table or removing the item entirely to ensure the mand is truly under the stimulus control of the EO.

Further, a practical limitation to the study was requiring a fixed number of targets per session. For every session, three targets were presented, whether it be two acquisition targets and one mastery target, one acquisition target and two mastery targets, all acquisition targets, or all mastery targets. From a research perspective, the consistency in number of targets presented per session may have served as an additional control for internal validity. However, this consistency may have slowed downed acquisition, explaining some of the plateaus in the acquisition data where there were multiple sessions with no new mand targets acquire. Limiting the number of targets may have prevented the chance to show further increase in acquisition data and teach the participants more vocal mands. Future studies should consider not limiting the number of targets per session.

Additionally, while it is plausible that the participants in this study developed generalized mand repertories, explicit generalization probes for novel mand targets, EOs, and discriminative stimulus conditions were not included in the procedures of this study. To truly investigate the development of a generalized mand repertoire, future research should include investigations with generalization probes throughout the course of mand training. This extension would help confer the development of a generalized mand repertoire, identify at what point in mand training do individuals develop a generalized mand repertoire, and what conditions may facilitate a generalized mand repertoire.

Finally, this study is limited in the number of participants and demonstrations of effect. There were only two participants who were included in the study, and thus there were only two demonstrations of the effectiveness of both video-based and in vivo mand training procedures. A functional relation cannot be determined with only two demonstrations of effect, at least three are required (Barton, Lloyd, Spriggs & Gast, 2018). Future research should extend this study by including a larger sample of participants to measure idiosyncratic responding to various prompting procedures. Moreover, future investigations should include participants with a known history of preexisting prompt dependency on vocal prompts. This line of work would narrowly investigate whether video models can more efficiently transfer stimulus control from antecedent prompts to the EO when teaching vocal mands to participants who are known to struggle with prompt dependency.

To summarize, the present study taught two young children with ASD to emit a variety of vocal mands using two interventions, in vivo and video-based mand training. Both interventions lead to successful transfer of stimulus control from prompts to the appropriate EOs. The results suggest that in vivo mand training may be an especially efficient and convenient method for teaching vocal mands to young learners with ASD, whereas video-based mand training may be beneficial when a child has a history of vocal prompt dependency or in vivo mand training is ineffective. Practitioners should consider ensuring continued mand training is a central focus of EIBI as a method for developing meaningful language, communication, and relationships.

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APPENDIX A: PROCEDURAL FIDELITY CHECKLISTS

<table>
<tr><th colspan="10">Procedural Fidelity Data For Baseline Sessions</th></tr>
<tr><td colspan="10">Session #   Intervention: Participant: Data Collector:</td></tr>
<tr><td colspan="4">Mastered Targets:
1.
2.
3.</td><td colspan="6">Acquisition Targets:
1.
2.
3.</td></tr>
<tr><td colspan="10">Preassessment Procedures</td></tr>
<tr><td>Conduct preassessment procedures on first trial for each target
- Show the participant the item, allow access to item if they reach for it
- or reinforce and code as trial if they mand for it</td><td colspan="9">+ -</td></tr>
<tr><td colspan="10">Baseline Targets</td></tr>
<tr><td>Trials</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>If vocal mand is emitted independently, reinforce with 15 seconds of access or larger edible</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>If participant engages in PECS response, vocal response with support of PECS code as – but reinforce with 15 seconds of access or smaller edible</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>If participant does not emit PECS or vocal mand code as -</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="10">Terminating Session</td></tr>
<tr><td colspan="5">Sessions are terminated once
- Once 1 trial of each mastered target and three trials of each acquired target are conducted
- After running the preassessment procedure three times without the participant reaching for the preferred stimuli
- Second instance of SIB, aggression, or elopement</td><td colspan="5">+ -</td></tr>
</table>

Figure 5. Procedural Fidelity Checklist used for Baseline and Control Probes

<table>
<tr><th colspan="10">Procedural Fidelity Data For In Vivo or Video Model Sessions</th></tr>
<tr><td colspan="10">Session # Intervention: Participant: Data Collector:</td></tr>
<tr><td>Mastered Targets:
1.
2.
3.</td><td colspan="9">Acquisition Targets:
1.
2.
3.</td></tr>
<tr><td colspan="10">Preassessment Procedures</td></tr>
<tr><td>Conduct preassessment procedures on first trial for each target
- Show the participant the item, allow access to item if they reach for it
- or reinforce and code as trial if they mand for it</td><td colspan="9">+ -</td></tr>
<tr><td colspan="10">Probe for Mastery</td></tr>
<tr><td>Mastered targets are probed and reinforced if emitted or moved to training trials if errored
- 1 trial per target
- Can be emitted during preassessment or after contriving EO</td><td colspan="3">1.
+ - NA</td><td colspan="3">2.
+ - NA</td><td colspan="3">3.
+ - NA</td></tr>
<tr><td colspan="10">Acquisition Targets</td></tr>
<tr><td>Trials</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>Contrive EO</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Provide 5 second delay</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>If vocal mand is emitted independently, reinforce with 30 seconds of access or larger edible</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>If participant is not in prompting and errors, remove item, present series of one step distractor trials, next trail</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>If prompting, present correct model (in vivo or video)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Reinforce prompted response with 15 seconds of access or smaller edible</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>If prompt is delivered by incorrect response, remove item, present series of one step distractor trials, next trail</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Conduct 3 trials per target</td><td colspan="9">+ -</td></tr>
<tr><td colspan="10">Terminating Session</td></tr>
<tr><td colspan="4">Sessions are terminated once
- Once 1 trial of each mastered target and three trials of each acquired target are conducted
- After running the preassessment procedure three times without the participant reaching for the preferred stimuli
- Second instance of SIB, aggression, or elopement</td><td colspan="6">+ -</td></tr>
</table>

Figure 6. Procedural Fidelity Checklist used for In Vivo and Video Mand Training Procedures

APPENDIX B: DATA COLLECTION MATERIALS

<table>
<tr><td colspan="3">Data Collection Sheet</td></tr>
<tr><td colspan="3">Date: Participant:

Session: Baseline In Vivo Video Model #_____</td></tr>
<tr><td colspan="2">Mastery Targets to Probe
1.

2.

3.</td><td>Acquisition Targets & Start Prompts
1.

2.

3.</td></tr>
<tr><td>Trail #</td><td>Mand Target</td><td>Code/ Response</td></tr>
<tr><td colspan="3">Mastered Mands</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Acquired Mands</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td></tr>
<tr><td>8</td><td></td><td></td></tr>
<tr><td>9</td><td></td><td></td></tr>
<tr><td colspan="2">Number of Mands Mastered
In Session:_______________

Cumulative: ______________</td><td>Number of Mands Acquired
In Session:_______________

Cumulative: ______________</td></tr>
<tr><td colspan="2">Mastered Targets to Probe:
1.

2.

3.</td><td>Acquired Target End Prompts
1.

2.

3.</td></tr>
</table>

Figure 7. In Session Data Collection Sheet for Dependent Variables

Brief MSWO Preference Assessment			
Date:	Participant:	PA #1:	
Items	**Trail**	**Item Selected**	**Position of Item Selected**
A: ___________________	**1**		X X X X X
B: ___________________	**2**		X X X X
C: ___________________	**3**		X X X
D: ___________________	**4**		X X
E: ___________________	**5**		X
F: ___________________	**1**		X X X X X
G: ___________________	**2**		X X X X
H: ___________________	**3**		X X X
I: ___________________	**4**		X X
J: ___________________	**5**		X
K: ___________________	**1**		X X X X X
L: ___________________	**2**		X X X X
M: ___________________	**3**		X X X
N: ___________________	**4**		X X
O: ___________________	**5**		X

Highest Preferred #1	**Highest Preferred #2**	**Highest Preferred #3**
1.	1.	1.
2.	2.	2.
Baseline Targets	**In Vivo Targets**	**Video Modeling Targets**
1.	1.	1.
2.	2.	2.
3.	3.	3.

Figure 8. Data Collection Sheet for Brief MSWO Preference Assessments and Determination of Mand Targets